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ABSTRACT

The Study Activity Questionnaire (SAQ) was administered to 83 college students who were enrolled in either an introductory research methods course or an introductory statistics course in the college of education at one university. At the beginning of the term the students completed the SAQ with reference to how they typically studied (pretest), and at the end of term they responded to the questionnaire with reference to how they studied for the target course (posttest). The study found consistently high inter-item reliabilities across SAQ scales on both test administrations. The study also found that activities varied as a function of reference course, time, and context. Composite cognitive scores in the test preparation context increased for students enrolled in the research methods course, and these scores decreased for students enrolled in the statistics course. A similar finding was observed for effort management scores, with scores increasing in the research course and decreasing in the statistics course. Finally, the study found that higher scores on two SAQ scales (initiative and representation) in the test preparation context were positively associated with final exam scores. Contains nine references. (Author/JB)

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An Exploratory Study of College Students' Study Activities and their Relationship to Study Context, Reference Course, and Achievement

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Running head: COLLEGE STUDENTS' STUDY ACTIVITIES

Abstract

The Study Activity Questionnaire (SAQ) was administered to 83 college students who were enrolled in either an introductory research methods course or an introductory statistics course in the college of education at one university. At the beginning of the term the students were asked to complete the SAQ with reference to how they typically studied (pretest), and at the end of term they responded to the questionnaire with reference to how they studied for the target course (posttest). One purpose of the present study was to assess the reliability of the instrument, and we found consistently high inter-item reliabilities across SAQ scales on both the pre and posttest administrations. A second purpose of this study was to investigate college students' study activities and whether their study practices differed depending on (1) whether they were responding with reference to how they typically study or how they studied for the target course, (2) whether they were enrolled in the research methods or statistics course, and (3) whether they were reading an assignment for the first time, engaging in in-class activities, or preparing for the exam. We found that study activities varied as a function of reference course, time, and context. Composite cognitive scores in the test preparation context increased for students enrolled in the research methods course, and these scores decreased for students enrolled in the statistics course. A similar finding was observed for effort management scores, with scores increasing in the research course and decreasing in the statistics course. Finally, we investigated the relationship between SAQ scores and achievement. Our results revealed that higher scores on two SAQ scales (Initiative and Representation) in the test preparation context were positively associated with final exam scores.

An Exploratory Study of College Students' Study Activities and their Relationship to Study Context, Reference Course, and Achievement

The present study is based upon the theory and findings of two large-scale research projects conducted by Rohwer, Thomas, and their colleagues who investigated the relationships between student study activities, achievement, and course characteristics. These researchers have repeatedly found that the characteristics of a particular course influence how students' study as well as their achievement (e.g., Curley, Estrin, Thomas, Rohwer, 1987; Thomas, Bol, Warkentin, Wilson, Strage, & Rohwer, 1993; Thomas, Inventosh, & Rohwer, 1987). For example, more extensive use of feedback provided to students, identified as a supportive practice, was found to be linked to students' use of more productive types of study strategies. In contrast, course practices known as compensations (Strage, Tyler, Rohwer, & Thomas, 1987; Thomas, Bol, & Warkentin, 1991) or safety nets (Sanford, 1987) have been associated with less sophisticated types of study strategies because they abrogate the need for students to engage in more autonomous, higher level study practices. Course compensations include exposing students to test items prior to the test, providing extra credit, or allowing make-up exams.

The underlying assumption guiding this line of research is that because course characteristics influence student study activities, study practices will differ depending on the reference course. Furthermore, there is some evidence to suggest that study strategies differ by study context (Warkentin, Bol, & Thomas, 1990). That is, study activities may vary depending on whether students are reading an assignment, engaged in in-class activities, or preparing for an exam. Therefore, study strategies should be assessed with an instrument that asks students to describe their study activities for a particular course and in particular context. In their more recent study (Thomas et al., 1993) a locally developed instrument, the Study Activity Questionnaire (SAQ), was used to assess study activities with reference to a particular course and context (first time reading, in-class activities, and test preparation). The SAQ was administered on a Personal Computer to measure the study activities of high school biology students and to determine whether study behaviors were linked to course variables and achievement. Most scales were found to be reliable (Thomas et al., 1993), and there was also some evidence for the validity of the instrument (Warkentin, et al., 1990)

There are two theoretical frameworks underlying the development of the SAQ (Thomas & Rohwer, 1993). The first is a hierarchy of cognitive study activities that features four separate dimensions characterizing the level at which students process information, the kinds of knowledge products they focus on, any memory enhancing strategies they may use, and the source of initiative to engage in particular types of study activities. The second is a hierarchy of effort management activities that reflects how study activities are monitored, regulated, planned, and evaluated. Each

of the dimensions correspond to a separate scale on the questionnaire and items are presented within each of the three study contexts. These dimensions or scales are briefly described below.

Level of cognitive processing. A dimension indexing the extent to which students engage in generative or transformational processing while studying. The dimension ranges from (1) the encoding of course content, (2) the selection of important versus unimportant information, (3) the integration of information, to (4) the extension of application of information beyond a given context.

Representational level. A dimension delineating the knowledge products that serve as the 'content' of studying. The dimension ranges from lowest-level units (facts or details) to the highest level units (the implications of the information). The mid-level units include definitions or terms followed by main ideas or principles.

Initiative. A dimension referring to the source of the instigation to engage in particular study activities. This dimension ranges from (1) receptive (following the directives of external sources), (2) reactive (responding to cues about what to do), to (3) proactive (following internal directives for engaging in particular study activities). A high score for initiative reflects the learners' disposition to be proactive or internally directed while studying.

Memory Augmentation. A dimension indexing the extent to which students engage in activities to make the material more memorable. This dimension ranges from (1) no engagement, (2) duplicative activities (e.g., repeating the information over and over, (3) interpretive activities (e.g., putting the material on one's own words), to (4) constructive activities (e.g., making up study aids).

Effort Management. A hierarchical model that reflects a students' disposition to (1) self-monitor, (2) self-regulate, (3) plan, and (4) evaluate their study efforts with respect to time, concentration, and learning effectiveness.

Research Questions and Hypotheses

The first question addressed in this study was whether college students study activities could be reliably assessed using a paper and pencil version of the Study Activity Questionnaire (SAQ). The SAQ was initially developed as a computer administered questionnaire and was employed in previous research to investigate the relationships between study activities, achievement and course variables in high school biology courses (Thomas, Bol, Warkentin, Wilson, Strage, & Rohwer, 1993). In this previous study, moderate to high reliabilities were found for each of the scales.

Given that reliable measures of student study activities could be obtained, a second question focused on the kinds of study activities employed by students and the relationships between their study strategies with (1) context, (2) reference course, and (3) whether they were

describing how they typically studied (pretest) with how they studied for a particular course (posttest). In other words, what kinds of study activities do college students utilize while reading, during class sessions, and in test preparation contexts, and do their study practices differ by context, reference course, and pre to posttest administrations? We predicted that students' study activities would differ as a function of the course in which they were enrolled, study context, and pre versus post-test administrations.

Finally, we examined the relationship between student study practices for a particular course (posttest results) with their achievement in that course. Based on earlier research showing that study activities were linked to achievement (Thomas et al., 1993), we predicted that there would be a positive relationship between SAQ posttests scores and achievement. We also expected that higher scores on scales in the test preparation context would best predict achievement on the final exam.

Method

Participants

Participants consisted of 83 students enrolled in four graduate level courses in the College of Education at a large mid-southern university during the Summer of 1994. Fifty of these students were enrolled in an introductory statistics course (two sections) taught by one instructor, and 33 were enrolled in one of two introductory research methods courses taught by another instructor. Both were required courses for graduate students in the program.

With reference to demographic characteristics of the respondents, 87 percent were female, and 13 percent were male. The respondents were primarily white (77 percent); 18 percent were African American and 5 percent were Asian or Hispanic. The average age of the students was about 35, ranging from 22 to 57 years of age.

Measures

Study activities were measured on the SAQ which yields scores on the six scales (Level of Processing, Representational level, Initiative, Memory Augmentation, and Effort Management). Students were asked to respond to a series of items in one of three contexts: (1) reading an assignment for the first time, (2) in-class lecture, discussion or other activities, and (3) preparing for an exam. The items were composed of Likert type rating scales and checklists. Each item corresponded to a level within each of the study dimensions. There were a total of 52 items with 12 items representing Level of Processing, 9 items for Representation, 9 items for Initiative, 9 items for Memory Augmentation, and 13 items for Effort Management. Example posttest items for each scale are presented in Figure 1.

Achievement was measured by the total percentage score obtained in the class and scores on the final exam. The scores for both achievement measures were standardized for each instructor.

Procedure

During the first week of classes students were administered the SAQ and asked to respond to the items with reference to how they "typically" study. On the last day of regular classes (approximately six week later) an identical version of the SAQ was re-administered to students but they were asked to respond to the items with reference to how they studied for "this particular course." The length of time for completing the SAQ ranged from 20 to 30 minutes. Achievement data was obtained from instructors' records and other demographic information was obtained from items included on the SAQ pretest.

Results

We began our analyses by estimating the inter-item reliabilities for each scale SAQ scale. The next section summarizes the descriptive statistics for each scale of the SAQ. In order to assess whether student study activities varied by time (pre or post), course, context, and scale we employed a repeated measures MANOVA with course as the between level variable and time, context, and scale as repeated measures. Finally simple correlations were computed to explore the relationship between SAQ scale scores and achievement scores.

Reliability. Reliability was assessed using Cronbach's Alpha for each SAQ scale on both the pretest and posttest administrations of the questionnaire (See Table 1). The inter-item reliability estimates on the pre-test were consistently high across scales, ranging from a low of .71 for Effort management to a high of .82 for the Initiative scale. Similarly high reliability coefficients were found on the post-test version of the SAQ, ranging from .75 for Effort management to .89 for Memory augmentation.

How students study. Overall, this sample of students scored high on nearly all scales of the SAQ (See Table 2). These findings held whether they were asked to respond in reference to how they typically study or how they studied for "this particular course." For example, the mean scale score for Initiative on the posttest was 2.64 based on a 3-point scale. This finding suggests that these students tend to be self-directed and autonomous with respect to the source of their initiative to engage in different types of study strategies. Similarly, the mean Effort posttest score was 4.95 based on a 7-point Likert scale, suggesting that these students were disposed to monitor, regulate, plan, and evaluate their study activities. Given that our sample was composed of graduate students, the results indicating their use of more sophisticated and higher level study strategies is not surprising.

Differences in study activities by time, course, and context. Before computing the repeated measures MANOVA all scale scores were standardized. The design included the between level variable of course (research methods or statistics) and the three repeated measures of time (pre or post), context (reading, in-class, or test preparation), and scale (Level of Processing, Representation, Initiative, or Memory Augmentation). Because Effort Management items only appeared in the test preparation context, this scale was not entered into this initial analysis.

Our results revealed a significant three-way interaction between course, time, and context (Wilk's $\lambda_{2,69} = .88$, $p<.05$). None of the main effects or interactions by scale were statistically significant.

Because scale was not found to significantly interact with any of the other variables, we derived composite variables for each study scale in each of the three contexts using regression-based factor scores from a principal components analysis. This allowed us to conduct follow-up analyses with a single composite scale score rather than four separate scale scores.

A second repeated measures MANOVA was then performed using the composite cognitive study scale variables for each context. Again, we found a significant three way interaction between course, time, and context (Wilk's $\lambda_{2,65} = .89$, $p<.05$).

In order to identify the significant sources of variation, this analysis was followed by three separate tests, one for each context, with course as the between level variable and time as the repeated measure variable. As was noted earlier, effort items were only asked in the test preparation context. We performed a similar analysis on standardized effort scores for only this context.

The four follow-up ANOVA results appear in Tables 3 through 6, and the mean values for each course on the pre and posttests by context are plotted in Figures 2 through 5. A significant interaction between course and time ($F_{1,71}=10.56$, $p<.01$) was found on the composite cognitive variable in the test preparation context (See Table 5). Figure 4 illustrates the relationship for this significant interaction in the test preparation context, showing that in Course 1 (research methods), students' cognitive scores increased from pre to posttest while in Course 2 (statistics) these composite scores decreased. The mean composite scores increased from -.26 to .21 in Course 1, but decreased from .20 to -.07 in Course 2. A second significant interaction between course and time ($F_{1,71}=5.31$, $p<.05$) was also observed on Effort Management scores in the test preparation context (See Table 6). Figure 5 shows that a similar relationship was observed, with mean scores in Effort Management increasing in Course 1 (from .07 to .21) and decreasing in Course 2 (from -.52 to -.16). Though a significant interaction between course and time was not found in the other two contexts, there was a consistent pattern of increases in pre to posttest scores for Course 1 and decreases in pre to posttest scores in Course 2 (See Figures 2 and 3). These results suggest that cognitive and effort management strategies differ depending on the reference course.

The relationship between study activities and achievement. When correlating mean scale scores across contexts with the total course score, only Representation, was found to be positively correlated with overall achievement ($r=.25$, $p<.05$). Because it seemed plausible that student study strategies in the test preparation context would be associated with their final exam scores, we correlated scale scores in this context with achievement on the final exam. When scores for only the test preparation context were isolated, Representation and Initiative scores emerged as important predictors of final exam scores (Representation: $r=.24$; Initiative: $r=.25$, $p<.05$). These results suggest higher Initiative and Representation scores in the context of test preparation are linked to higher achievement scores.

Discussion

One purpose of the present study was to determine whether we can reliably measure students' study activities based on a theoretical framework proposed by Rohwer and Thomas. Our results revealed high inter-item reliability coefficients for most SAQ scales. Similarly high reliability estimates were also obtained when the SAQ was used to measure study activities of high school students enrolled in high school biology courses (Thomas et al., 1993). The paper and pencil version of the SAQ has the advantages of being easier and more economical to administer to large groups of students. The next obvious step would be to assess the test/ retest reliability of the instrument to ensure that it is stable across short intervals of time for one particular reference course.

The question of whether student study activities vary with respect to a particular reference course and context is important for understanding whether study practices are influenced by the specific characteristics of courses and study tasks. Our results suggest that students study activities varied from the pre to posttest administrations of the SAQ depending on whether they were enrolled in the research methods course or the statistics course and whether they were reading an assignment, engaging in in-class activities, or preparing for the exam. In the test preparation context, students who were enrolled in the research methods courses reported using more advanced, higher order types of study practices on the posttest. This pattern was reversed in the statistics course with student scores decreasing from pre to posttest versions of the test in the test preparation context. The findings of the earlier studies (Thomas et al., 1987, 1993) also provide evidence that students' study strategies are responsive to differences in course characteristics. One implication of these results is that student study activities are more accurately assessed in reference to a specific course and context rather than in reference to how one "typically" studies across courses and contexts.

One plausible, albeit post hoc, explanation for the finding of variations by course is the presence of compensations in the statistics course. The instructor allowed students to retake their

exams when their grades were lower than a B. Previous research has shown that the presence of compensations was related to lower study activity scores (Thomas et al., 1993), suggesting that students may not engage in more advanced cognitive strategies or be as diligent about managing their effort when preparing for an exam when have a "second chance" to enhance their test scores. However, this interpretation is tentative and numerous alternative explanations, most notably the differences in course content, may account for this finding. The content in research methods may facilitate more sophisticated types of study cognitive and effort management strategies when compared to the content in statistics courses because the subject matter can be more broadly applied and comprehensive.

Finally, we discovered a relationship between the kinds of study activities students employ when preparing for a test and achievement. Self-directed, proactive study efforts and a focus on higher level types of representations (main ideas, principals and their implications) when preparing for the exam were linked to higher final exam scores. Research on the relationship between study strategies and achievement was not consistent across scales in the earlier research projects (Curley, et al., 1987; Thomas et al., 1993), and in our study this association was only observed for two of the five SAQ scales. One reason for the absence of a stronger association between study strategies and achievement across scales is that the kinds of test items on the instructors' exams and other instructional practices were not taken into account. For instance the presence of compensatory practices may have diminished the cognitive demand of test items or moderated the relationship between study activities and achievement.

As is the case with most exploratory studies, our results raised as many questions as we attempted to address and highlighted a variety of issues and concerns to be addressed in future studies. Before embracing the hierarchical models developed by Thomas and Rohwer, evidence for their validity must be accumulated using different populations of students enrolled in different types of courses. More specifically, we need to conduct additional validity studies before using the SAQ as tool for understanding the nature of students' study behaviors and their relationship to course characteristics and achievement. Once we have more evidence for the reliability and validity of the models and instrument based on these models, a next step is to systematically investigate the kinds of course variables and contexts that promote or impede engagement in more productive types of study strategies.

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Table 1. Reliability coeficients by scale on the pretest and posttest versions of the SAQ.

Scale	Pretest	Posttest
Level of processing	.80	.79
Representational level	.75	.81
Memory augmentation	.81	.89
Initiative	.82	.81
Effort management	.71	.75

Table 2. Descriptive statistics by scale for pretest and posttest administrations of the SAQ.

	PRETEST			POSTTEST		
SAQ Scale	N	Mean	St Dev.	N	Mean	St. Dev.
Level of Processing	78	5.31	.72	79	5.29	.70
Representation	78	3.61	.36	79	3.55	.41
Memory Augmentation	78	3.38	.74	79	3.26	.93
Initiative	78	2.71	.38	79	2.64	.40
Effort Management	78	4.86	.71	79	4.95	.77

Table 3. ANOVA results for time and course by time for reading context.

Source	DF	SS	MS	F	Prob.
Time (Pre/Post)	1	.06	.06	.21	.65
Course by Time	1	.25	.25	.90	.35
Within	70	19.47	.28		

Table 4. ANOVA results for time and course by time for in-class context.

Source	DF	SS	MS	F	Prob.
Time (Pre/Post)	1	.14	.14	1.19	.28
Course by Time	1	.44	.44	3.66	.06
Within	71	8.62	.12		

Table 5. ANOVA results for time and course by time for test prepartion context.

Source	DF	SS	MS	F	Prob.
Time (Pre/Post)	1	.34	.34	.77	.39
Course by Time	1	4.72	4.72	10.56	.00
Within	71	31.72	.45		

Table 6. ANOVA results for time and course by time on Effort (test prepartion context).

Source	DF	SS	MS	F	Prob.
Time (Pre/Post)	1	.05	.05	.11	.75
Course by Time	1	2.42	2.42	5.31	.02
Within	71	32.33	.46		

Figure 1. Example items from the SAQ posttest for the test preparation context.

Level of Processing (integration)

While preparing for the test, I related ideas to other ideas presented in my reading or my notes.

Not at all like me		Somewhat like me		Like me		Very Much like me
1	2	3	4	5	6	7

Initiative (at level of integration)

What prompted you to relate ideas to other ideas while preparing for the test? (Check as many as appropriate.)

_____ The text, handouts, or study guides stated that relating ideas was important.
_____ The teacher told us to concentrate on relating ideas to other ideas.
_____ The teacher hinted that we should relate ideas to other ideas.
_____ I could tell from the way the text was written that I should relate ideas.
_____ I used my own judgment in deciding to relate ideas to other ideas.
_____ I tried to predict or anticipate on my own the relationship between ideas.

Representation (at level of integration)

While preparing for the test, what kind of information did you concentrate on to relate ideas to other ideas? (Check as many as appropriate.)

_____ Details or facts.
_____ Definitions or terms.
_____ The main ideas or principles.
_____ The implications of the information.

Memory Augmentation

While preparing for the test, I did something special to help me remember the material.

Not at all like me		Somewhat like me		Like me		Very Much like me
1	2	3	4	5	6	7

Effort Management: Monitoring Time

While studying for the test in this course, I kept track of whether I had enough time to complete my studies.

Not at all like me		Somewhat like me		Like me		Very Much like me
1	2	3	4	5	6	7

Figure 2. Mean composite pre and posttest scores by course: Reading Context.

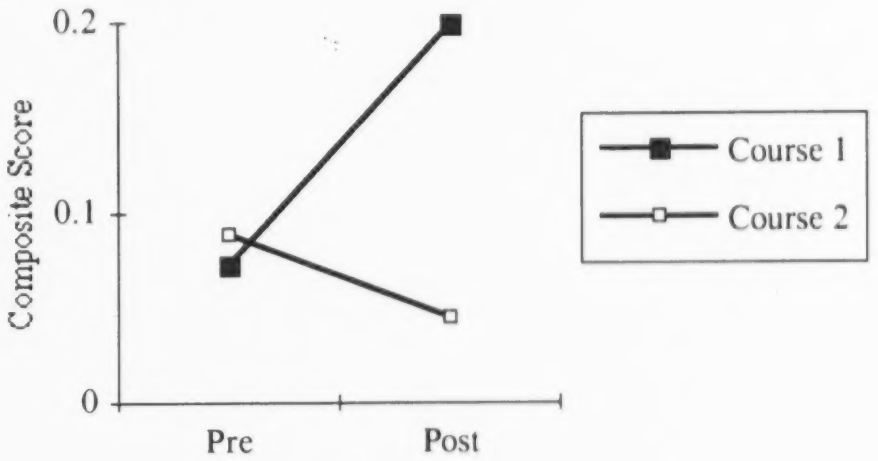

Figure 3. Mean composite pre and posttest scores by course: In-class Context.

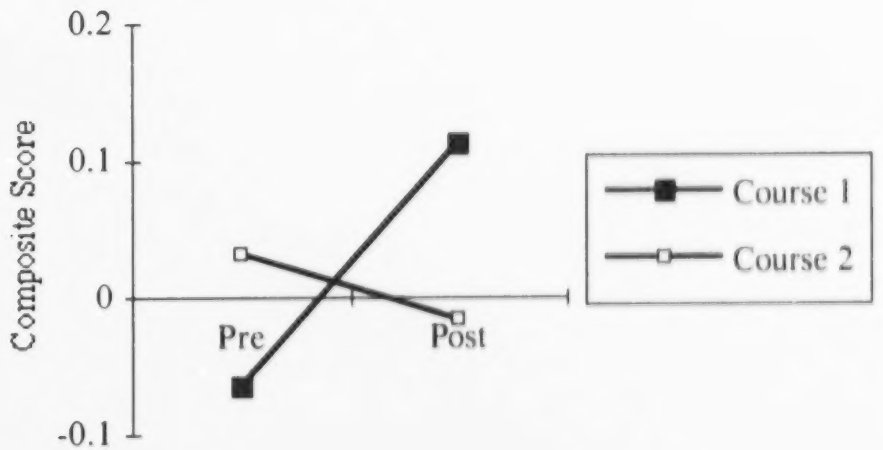

Figure 4. Mean composite pre and posttest scores by course. Test Preparation Context.

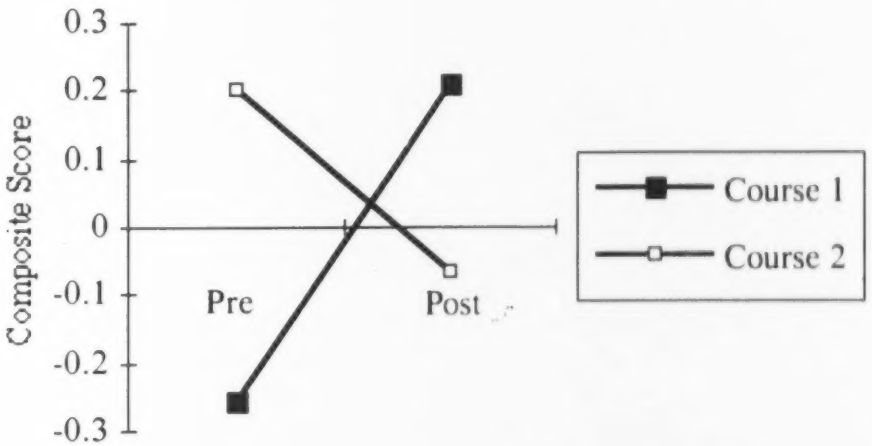

Figure 5: Mean effort pre and posttest scores by course: Test Preparation Context.